"Skin Cancer Early Detection and Prevention for the Primary Care Physician"
Assessing and Changing Physicians' Knowledge, Attitudes, and Behaviors

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A Master's Paper submitted to the faculty of
The University of North Carolina at Chapel Hill
In partial fulfillment of the requirements for
The degree of Master of Public Health in
The Public Health Leadership Program

Chapel Hill

2002

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4/22/02
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ABSTRACT

Context: Skin Cancer is of growing public health concern. The incidence and mortality of skin cancer continues to rise. The morbidity and mortality from skin cancer is directly proportional to the depth of invasion of the tumor. Primary care physicians are in an optimum position to diagnose skin cancer due to their frequent exposure to patients. However, it is not clear if primary care physicians have adequate knowledge or diagnostic ability to detect skin cancer. Additionally it is not clear if primary care physicians are screening or counseling high- risk patients.

Objectives: To assess primary care physicians' knowledge, attitudes, and behavior concerning early detection and prevention of skin cancer, and to assess changes in primary care physicians' knowledge, attitudes, and behavior following implementation of a brief educational intervention developed by the authors.

Design: Prospective Randomized Controlled Trial

Setting and Participants: Family medicine and internal medicine residency programs (9 total) in academic and community based settings were randomized to control or intervention groups. Participants from both groups (174 total) completed an initial survey to assess baseline knowledge, attitudes, and behavior with regards to early detection and prevention of skin cancer. The control groups attended their normal conference while the intervention groups attended a skin cancer education module. The same survey was completed again at 2-4 weeks follow up by 88 of the original 174 participants. Of the 88 participants who completed both surveys, 43 were in the intervention group and 45 were in the control group. Baseline and follow up surveys were analyzed.

Intervention: 1-hour educational presentation covering skin cancer epidemiology, diagnosis, decision-making, screening, and counseling. A copy of the presentation and additional educational materials provided to participants can be found in appendix 1.

Main Outcome Measures: Participant survey responses at baseline and follow-up. The survey found in appendix 2 tested skin cancer knowledge, diagnostic ability, attitudes, and behavior.

Results: The baseline survey revealed primary care physicians' deficiencies in general skin cancer knowledge and diagnostic ability. 28% knew the lifetime risk of melanoma for someone in the year 2000 and 18% correctly identified 3 out of 3 melanomas. 43% knew all four of the ABCD's of melanoma, and 18% listed at least 5 risk factors for skin cancer. Following the educational intervention, participants in the intervention group gained significant knowledge and diagnostic ability. Participants in the intervention group scored significantly better on: 3 of 6 general skin cancer knowledge questions, listing the ABCDs of melanoma, and listing risk factors of melanoma. Participants in the intervention group correctly diagnosed 2 of the 3 melanomas more frequently than those in the control group. Primary care physicians in the intervention group reported performing skin cancer preventive or early detection measures with new or high-risk patients more often than those in the control group.

Conclusions: Primary care physicians possess inadequate knowledge, diagnostic skills, and preventive behaviors with regards to skin cancer prevention and early detection that can be improved using a brief educational intervention.

Introduction

Skin cancer affects more than one million people a year in the United States and is a growing public health concern. Skin cancer incidence rates and mortality rates have been rising despite public health efforts. The depth of invasion of skin cancer is directly related to morbidity and mortality. Therefore, lesions that are diagnosed at an earlier stage may be less likely to cause significant morbidity or mortality than lesions diagnosed at a later stage.

Primary care physicians see a large proportion of the population each year and are in a position to be able to diagnose thinner lesions. However primary care physicians must possess adequate diagnostic ability to distinguish cancerous and pre-cancerous lesions from benign lesions. In addition primary care physicians must recognize the risk factors for skin cancer so they can appropriately stratify patients into groups that require further intervention (screening or counseling). Some studies suggest that primary care physicians have difficulty diagnosing skin lesions. In addition primary care physicians are not screening and counseling patients at high risk for skin cancer. A lack of knowledge and skills contributes to the lack of screening and counseling performed by primary care physicians. An effective educational module may improve the knowledge, attitudes, and behaviors of primary care physicians. If successful, these improvements may decrease the morbidity and mortality from skin cancer in the United States.

Epidemiology

Skin cancer can be classified into three main types based upon the involved skin cell type: basal cell carcinoma, squamous cell carcinoma, and melanoma.

Each type is biologically and epidemiologically distinct. Basal cell carcinoma (BCC) is the most common skin cancer while squamous cell carcinoma (SCC) is the second most common. Collectively squamous cell and basal cell carcinoma are referred to as non-melanoma skin cancer (NMSC). Even though melanoma is the least common of the three, it causes significant mortality.

An estimated 900,000 new cases of basal cell carcinoma occur each year (1). The incidence rate of BCC is rising, with one study demonstrating an 80% increase between 1980 and 1994 in the northeastern United States (2). Additional studies show increases in incidence of BCC in the US, Europe, and Australia (1,3-4). BCC usually presents as a pearly papule with a semi-transluscent raised border with overlying fine telangiectasias. Although BCC usually occurs on the face and neck, as many as 20% may occur in non-sun exposed areas of the body (5). One study of over 1500 BCCs showed the following site distribution: nose 25%, periorbital area 7%, lips 4%, ears 3%, other parts of the face 29%, neck 11% and trunk 15% (6). Fortunately, BCC is usually a slow growing, locally invasive tumor that rarely metastasizes. Incident rates of metastasis range from .0028% to .1%(7-9). BCC can invade locally causing significant morbidity and disfigurement, especially when located on the face. Given the large, increasing incidence rate of BCC and its ability to cause significant morbidity, primary care physicians play an important role in diagnosing these lesions. Risk factors for BCC include fair skin, increased cumulative sun exposure, and having a previous BCC; 45% of people with one BCC will develop another within 5 years (10).

Squamous cell carcinoma (SCC) comprises approximately 20% of the greater than 1 million new diagnoses of skin cancer each year (1). Paralleling that of BCC, the incidence rates of SCC are also increasing. One study in the northeastern US showed the incidence rate of SCC increased by 235% for men and by 350% for women between 1980 and 1994. Another study in Minnesota showed the annual SCC age adjusted incidence rates per 100,000 people rose from 46 in women and 136 in men (1984-1986) to 100 in women and 156 in men (1990-1992). Similar increases have been seen in Australia and the UK (3,11-12). SCC usually presents as a hyperkeratotic erythematous to skin colored nodule or plaque with an ulcerated center. Development of SCC is related to both increased cumulative sun exposure and increased age. Unlike BCC, SCC has a higher rate of metastasis, with estimates ranging from 1 to 20% (13-14). Primary care physicians again have a role in diagnosing SCC early in its course to prevent lesions from causing excessive local damage or metastasizing.

Although melanoma is the least prevalent of the three main types of skin cancer, it accounts for 80% of the deaths from skin cancer. The American Cancer Society estimates that in 2002, 53,600 Americans will be diagnosed with invasive melanoma and 7,400 Americans will die from the disease (15). This incidence of melanoma has increased 4% in the last year (15). Furthermore the incidence of melanoma in the US has tripled over the last 22 years (15). Excluding other skin cancers, melanoma is currently the fifth most common cancer in men and the sixth most common cancer in women in the US (15). Melanoma is also the most common cancer in women between the ages of 25 and 29 (15). The incidence rate

of melanoma has risen sharply. In 1935 an American's lifetime risk of developing melanoma was 1/1500 (16). Current estimates suggest that the lifetime risk of developing melanoma for an American is 1/68 (15). Unfortunately, the mortality rate from melanoma has also been rising. The Surveillance, Epidemiology, and End Results Program (SEER) has shown a 32.7% increase in mortality rates between 1973 and 1995 (17). Prognosis of a primary lesion depends greatly upon the tumor depth at diagnosis. The five year survival rate for primary tumors without metastasis is >95% when the lesion is < .76 mm and approximately 50% when the lesion is > 4mm.

Primary Care Physicians

Primary care physicians (PCPs) have ongoing contact with the majority of the US population. This gives PCPs an opportunity to detect skin cancer at its earliest stages. PCPs may also counsel patients on skin cancer prevention measures. Primary care physicians regularly examine over 70% of the US population. The average American visits a primary care physician 1.7 times per year (18). Many fewer people see dermatologists regularly. A study of patients diagnosed with melanoma showed that 87% of the patients had primary care physicians and 63% of the patients had seen a physician within the year prior to their diagnosis with melanoma. Only 20% of the patients had seen a dermatologist in the past (19).

Even though primary care physicians have access to the US population, they may not have the tools needed to diagnose skin cancer lesions. In a study by Cassileth et al., only 12% of 105 non-dermatologists were able to diagnose 5 of 6 melanomas presented as photographs (compared to 69% of dermatologists) (20).

In the same study, only 38% of primary care physicians correctly diagnosed 4 of the 6 melanomas (20).

The role of the primary care physician in screening for skin cancer is a matter of some controversy. Although primary care physicians may have an important role in correctly diagnosing pre-cancerous and cancerous lesions, that does not necessarily mean that primary care physicians should screen their entire patient population for skin cancer. Even though the American Academy of Dermatology and The American Cancer Society recommend periodic skin exams by physicians, the US Preventive Services Task Force has found insufficient evidence to recommend FOR or AGAINST routine screening exams (21). This comes from the lack of randomized controlled trials that show screening of the general population reduces the morbidity or mortality from skin cancer. A randomized controlled trial of a population based early detection program is being planned in Queensland, Australia. Due to the large number of people who will need to be enrolled and followed, and the time needed for follow-up, this trial will not conclude until 2010 (22).

Limiting screening to only high-risk patients may be a feasible option. A recent cost-effective analysis of screening high-risk patients showed an incremental cost-effective ratio of $29,170 per year of life saved (23). This figure is less than the often used "cost effective cut-off " of $50,000 per year of life saved and also less than $46,410 per year of life saved by pap smears done every 3 years (23).

Thus primary care physicians may choose to screen, in addition to counsel, their high-risk patients with regard to skin cancer. Performance rates of counseling and screening high-risk patients are low. A study examined data on skin cancer counseling and skin examinations that was obtained from representative visits to outpatient physicians in the United States from the 1997 National Ambulatory Medical Care Survey (24). This survey included records of 703 million outpatient visits in 1997. For this study, high-risk patients where defined as patients who had a personal history of a skin cancer or a pre-cancerous lesion. Family Physicians documented providing skin cancer prevention counseling at 24% of the visits by "high-risk" patients (24). Internal medicine physicians documented providing skin cancer prevention counseling at 7.7% of the visits by "high-risk" patients (24). In the same study, screening practices of primary care physicians were examined. The frequency that physicians documented examining the skin of "high-risk" patients was analyzed by specialty. Documented skin exams were performed by family physicians on these "high-risk" patients only 27% of the time (24). Internal medicine physicians documented performing skin exams on these "high-risk" patients 0% of the time (24). This lack of screening and counseling may be attributed to primary care physicians' lack of knowledge and diagnostic abilities. Other explanations could also include lack of time, inappropriateness for the type of visit, or lack of documentation.

Many primary care physicians are interested in improving their knowledge and skills in skin cancer detection. In a survey used to assess what type of

education primary care physicians felt they needed in North Carolina, physicians listed screening for skin cancer, diagnosis of skin cancer, and prevention of skin cancer as a high priority (25).

Working with the North Carolina Advisory Committee on Cancer Coordination and Control and in collaboration with Martin Weinstock, MD/PhD, the author and a colleague developed "Skin Cancer Prevention and Early Detection: Strategies and Skills", a continuing medical education module for primary care clinicians. To test the effectiveness of this module in improving knowledge and skills for skin cancer detection and management, we designed a randomized controlled trial of primary care residency programs, using a pre/post survey to measure change.

The aims of the study are to: 1) assess primary care physicians' knowledge, attitudes, and behavior with regard to early detection and prevention of skin cancer; and 2) assess changes in primary care physicians' knowledge, attitudes, and behavior following implementation of a brief educational intervention.

Methods

Design and Setting

We performed a prospective randomized controlled trial on 9 internal and family medicine residency programs set in both the academic and community setting. Following IRB approval from the UNC SPH, an email was sent to all residency directors of the 15 Family Medicine and Internal Medicine programs in North Carolina with greater than 23 residents, inviting them to participate in the study. Nine programs (3 Family Medicine and 6 Internal Medicine) agreed to participate

and were randomized to receive the intervention or control using a random number generator. We informed the programs of the group to which they were randomized and we scheduled a date for the initial visit. We made all visits during residency programs normal "noon conferences." These are conferences that residents usually attend every week-day at which different educational topics are presented to them. The principal investigators visited all nine sites together for the initial visit, during which we informed all of the participants that attended "noon conference" on the day of our initial visit of the purpose and requirements of our study. We obtained signed informed consent from nearly 100% of the attendees at the initial visit. A few attendees did not complete the survey because they were paged away from the conference early.

Intervention

We developed a module to educate physicians on early detection and prevention of skin cancer (appendix1), consisting of a presentation with 80 slides. The module incorporated the Basic Skin Cancer Triage Algorithm developed by Weinstock (30). An information folder was assembled that contained: a handout of the presentation, a copy of the Basic Skin Cancer Triage Algorithm, a self administered melanoma risk stratification questionnaire, and a pamphlet entitled "Why You Should Know About Melanoma" from the American Cancer Society (appendix1). We developed the module to be a continuing medical education (CME) course for physicians in North Carolina sponsored by The North Carolina Advisory Committee on Cancer Coordination and Control.

Data Collection

We developed a 48-question survey that tests: general skin cancer knowledge, skin lesion diagnostic ability, attitudes toward skin cancer prevention and early detection, and behaviors toward skin cancer prevention and early detection. After obtaining informed consent at the initial visit, the participants completed the 10-minute survey. Following collection of all surveys, the groups randomized to intervention received the information packet and observed our presentation on early detection and prevention of skin cancer for the primary care physician. Following collection of all surveys at the control sites, the normal "noon-conference" scheduled for that day proceeded. 174 participants completed the initial survey. 2 to 4 weeks following the initial visit, the authors returned to another "noon-conference" at each site. At the return visit we asked the participants to fill out the same survey once again to test the effectiveness of our intervention. Of the 174 participants that filled out the initial survey, 88 (51%) filled out the post survey. Of the 88 participants who completed both the initial and follow-up survey, 43 (49%) were in the intervention group, and 45 (51%) were in the control group. We attribute much of the drop out to the fact that many of the participants who filled out the initial survey were not at the "noon conference" when we returned for follow-up.

Data Analysis

I performed initial analysis on all of the baseline survey results. Additionally I performed analysis on the baseline and follow up survey results for the control and intervention groups.

For the initial baseline survey results I determined participant characteristics and used counts and proportions to characterize the categorical variables (multiple-choice questions). I used Pearson's Chi-square test to measure associations between participant characteristics and correct answers on the multiple-choice questions. I calculated medians and standard deviations for continuous variables.

I next compared initial responses to the multiple choice questions to follow-up responses. I calculated counts and proportions of the participants who responded correctly at both times. I used Fishers exact test to test if the proportions of correct answers were different between intervention and control groups in the baseline and the follow-up survey. For the continuous variables, I calculated means and standard deviations for the intervention and control groups at both baseline and follow-up. I used Students t-test to determine if the responses between intervention and control groups differed at baseline or at follow-up. All t-tests used were 2 sided with an alpha level of .05. I performed statistical analyses using Intercooled Stata version 6.0.

Results

Characteristics of Participants

Table 1 shows the baseline characteristics of all participants completing the initial survey. Faculty (5%) and medical students (9%) made up a small proportion of those filling out the survey; medical residents (86%) made up the majority. 46% of those completing the survey were in an academic medical

setting and 54% were in a community based medical setting. 75% of the respondents were in internal medicine residency programs; 25% were in family medicine residency programs. 45% of those responding had completed a clinical dermatology rotation lasting greater than 2 weeks during their training while 55% had not. 50% of the respondents anticipated having a clinical dermatology rotation lasting greater than 2 weeks before completing training. 51% of the respondents reported primary care as their career choice, while 49% were planning on subspecialty training or were undecided.

BASELINE SURVEY RESULTS:

The initial survey consisted of 6 sections: general skin cancer knowledge; diagnostic ability; knowledge of physical exam characteristics and skin cancer risk factors; attitudes toward skin cancer prevention and early detection; behavior when interviewing a "high-risk" or new patient; and participant demographics. I will examine each in sequence.

Knowledge

Table 2 shows questions and responses to the general knowledge questions. Correct answers are highlighted in bold. Eighty-five percent of respondents correctly reported that the most common cancer presenting to the primary care physician was skin cancer. However, 15% reported that lung, breast, or colon cancer presented more often to primary care physicians than skin cancer, when in fact all combined do not present as often as skin cancer. Eighty-five percent of

respondents correctly identified actinic keratosis as a pre-cancerous lesion. Participants who had a clinical dermatology rotation lasting greater than 2 weeks were more likely to identify actinic keratosis as a pre-cancerous lesion (OR 3.08 95%CI 1.19-7.92) than those who had not. Only 60% of respondents correctly identified basal cell carcinoma as the most common skin cancer, while 33% incorrectly identified squamous cell carcinoma and 7% incorrectly identified melanoma as the most common skin cancer. Participants who had a clinical dermatology rotation lasting greater than 2 week were more likely to identify basal cell carcinoma as the most common type of skin cancer (OR 2.19 95% CI 1.17-4.12) than those who had not. 59% of respondents underestimated the lifetime risk of developing melanoma, while 30% correctly identified the current lifetime risk of 1/74. 40% of respondents under estimated the 5 year mortality rate for a melanoma that is < .75 mm thick and 18% over estimated the 5 year mortality rate for a melanoma that is > 4 mm thick.

Diagnostic ability and decision making

The next section evaluated the participants' ability to diagnose skin lesions. Results for these questions are found in table 3 with correct answers highlighted in bold. Section 2 also evaluated the physician's decision-making skills. The definitions for the answers to "What would you do next?" are as follows: a. Act (biopsy and/or refer), b. Reassure the patient and provide counseling and education, c. Track (Reevaluate in 2 months to look for change in the lesion), d.

Perform cryotherapy and follow up. Pictures of the lesions corresponding to each question can be found in appendix 2.

60% correctly identified lesion A as a melanoma. 99% of those who correctly chose melanoma reported they would "act" on the lesion. However, only 74% of all participants would have "acted" on the lesion. Only 32% of those surveyed correctly identified lesion D as a melanoma. Close to 7 out of 10 would have misdiagnosed this cancer. 99% of those who correctly chose melanoma reported they would "act" on the lesion. However, only 47% of all participants would have "acted" on the lesion. Disturbingly, 16% of respondents would have "reassured" the patient with this melanoma. 80% correctly identified lesion F as a melanoma. 99% of those who correctly chose melanoma reported they would "act" on the lesion. However, only 88% of all participants would have "acted" on the lesion. In total, only 31 of 173 (18%) respondents correctly identified 3 out of 3 melanomas. 98/173 (57%) correctly identified 2 of 3 melanomas and 167 out of 173 (97%) correctly identified 1 of 3 melanomas. 88% correctly identified lesion B as a basal cell carcinoma and 84% chose to act on this lesion. 93% of respondents who correctly chose basal cell carcinoma decided to "act" on the lesion. 89% correctly identified lesion C as a nevus. 53% chose to "reassure" these patients. 67% correctly identified lesion D as a seborrheic keratosis and 45% chose to "reassure" these patients. Participants who had a dermatology rotation were more likely to correctly identify the seborrheic keratosis. (OR-1.8 95%CI 0.95-3.5)

Knowledge of The ABCD's of Melanoma

In this section participants were asked to list 4 physical exam characteristics of a skin lesion that would suggest melanoma. Results are found in table 4. 54% correctly identified assymetry, 89% correctly identified border irregularity, 89% correctly identified color variation, and 75% correctly identified large diameter as suggestive of melanoma. Only (75/173) or 43% of participants listed all 4 of the characteristics. 75% listed 3 of the 4 characteristics and 88% listed 2 of the 4 characteristics.

Knowledge of The Risk Factors for Skin Cancer

Participants were asked to list risk factors for skin cancer. The results are shown in table 5. 96% listed excessive sun exposure and 67% listed family history of skin cancer. Only 57% listed fair skin and only 24% listed personal history of skin cancer. 29% listed a history of blistering sunburns and 20% listed genetics. Participants who had a dermatology rotation were more likely to list genetics as a risk factor (OR 2.12 95%CI .986-4.55). Less than 10% listed immunosuppression, large congenital nevi, dysplastic nevi, actinic keratosis, or lentigo maligna. 100% listed at least 1 risk factor for skin cancer, 91% listed at least 2 and 68% listed at least 3. Only 39% listed at least 4 and 18% listed at least 5 risk factors. Few (5%) listed 6 or more risk factors.

Attitudes toward skin cancer prevention and detection

In this section participants were asked to evaluate statements regarding attitudes on skin cancer prevention and detection. Participants felt that early detection of skin cancer can improve morbidity and mortality. They also felt that lack of time and lack of education limited skin cancer prevention and early detection. Participants also felt that patients desire counseling, and that counseling can be effective.

Physician behavior at a visit with a "high-risk" patient

In this section participants were asked to evaluate statements that tested behaviors at a visit with a "high-risk" patient. Table 7 shows results. Participants reported that they infrequently performed total body skin exams, ask about the use of sunscreen, or advice or counsel on skin cancer risk.

Physician behavior at a visit with a "new" patient

In this section participants were asked to evaluate statements that tested behaviors at a visit with a "new" patient. Participants infrequently ask patients if they regularly examine their skin for growths or changes in lesions, ask about a personal or family history of melanoma, ask if patients use sunscreen regularly or ask about a history of blistering sunburns. Participants infrequently advise the use of sunscreen, advise midday sun exposure, advise to use hats or other protective clothing, or advice to perform regular skin examinations for growths or changes in spots.

FOLLOW-UP SURVEY RESULTS

Of the 174 participants who filled out the initial survey, 88 also filled out the follow up survey. Of these 88 participants, 43 were in the intervention group and 45 were in the control group. This section will examine the differences in responses at baseline and follow-up between the participants in the control and intervention groups. The results are presented comparing intervention and control groups at baseline and follow up. For sections "General Knowledge", "Diagnostic ability and decision making", "ABCD's of Melanoma", and "Risk Factors for skin cancer" the proportion answered correctly by intervention and control groups was compared at baseline and follow up. If the proportion correct in the intervention and control groups are similar at baseline but different at follow up (higher in the intervention group), then the intervention did have an effect. If the proportion correct in intervention and control groups are similar at baseline and at follow up, then the intervention did not have an effect. If the proportion correct in intervention and control groups are different at baseline, then no conclusion can be made about the intervention. For the remaining sections, the means at baseline and follow up were compared between intervention and control group. If the difference in the intervention group was significantly different from the difference in the control group, then the intervention had an effect.

Knowledge

Participants' responses at baseline and follow up to the general skin cancer knowledge questions are found in Table 9. The results are presented comparing

baseline and follow up responses by study group. For the general knowledge questions, participants in the intervention group performed better at follow up in answering 3 of the 6 questions. Participants in the intervention group were more likely to respond correctly to questions about lifetime risk of melanoma and 5-year survival rates for thin and thick lesions.

Diagnostic ability and decision making

Participants' responses at baseline and follow up to the diagnostic ability and decision making are found in Table 10. Participants in the intervention group performed better at identifying 2 of the melanomas at follow up and were more likely to "act" on the diagnosis

Knowledge of The ABCD's of Melanoma

Participants' responses at baseline and follow up to the knowledge of the ABCD's of melanoma are found in table 11. Although results were not statistically significant, participants in the intervention group listed all four of the characteristics more often than those in the control group at follow up.

Knowledge of The Risk Factors for Skin Cancer

Participants' responses at baseline and follow up to the risk factors for skin cancer are found in table 12. The results are broken down comparing intervention versus control and baseline versus follow up. Participants in the intervention group performed better at follow up than those in the control group in listing 7 of

the risk factors for skin cancer: personal history of skin cancer, high number of common nevi, history of blistering sunburns, presence of a dysplatic nevi, presence of a actinic keratosis, presence of a large congenital nevi, and presence of a lentigo maligna.

Attitudes toward skin cancer prevention and detection

Participants' responses at baseline and follow up regarding their attitudes toward skin cancer prevention and detection can be found in Table 13. The participants' change in response between baseline and follow up for both the intervention and control groups can be found in Table 13A. The change in response between baseline and follow up was significant for two statements: "Total body self exam is effective," and "I am confident in my abilities to diagnose skin lesions."

Physician behavior at a visit with a "high-risk" patient

Participants' responses at baseline and follow up regarding their behavior at a visit with a "high-risk" patient can be found in Table 14. The participants' change in response between baseline and follow up for both the intervention and control groups can be found in Table 14A. At follow up participants in the intervention group were more likely than participants in the control group to report higher frequencies of performing these stated behaviors: performing a total body skin exam, asking about the use of sunscreen, providing advise and counsel about skin cancer risk, and providing resource materials on skin cancer.

Physician behavior at a visit with a "new" patient

Participants' responses at baseline and follow up regarding their behavior at a visit with a "new" patient can be found in Table 15. The participants' change in response between baseline and follow up for both the intervention and control groups can be found in Table 15A. At follow up participants in the intervention group were more likely than participants in the control group to report higher frequencies of performing these stated risk stratifying behaviors: asking about a history of melanoma, asking about a family history of melanoma, asking about a history of tanning bed use, asking about sunscreen use, and asking about a history of blistering sunburns. Participants in the intervention group were also more likely to provide written materials about skin cancer prevention, and provide sun safety counseling.

Discussion

In this study conducted in Internal Medicine and Family Medicine residency training programs, we found significant deficiencies in knowledge and diagnostic abilities of primary care physicians with regard to skin cancer. Other similar studies have also documented lack of knowledge and diagnostic skills in primary care physicians. Stephenson found that more than 50% of family physicians lacked confidence in being able to recognized melanoma, 30% were not confident in their ability to diagnose basal cell carcinoma, and greater than 50% were not

confident in their ability to diagnose squamous cell carcinoma or dysplastic nevi (26).

Additionally, physicians in this study had difficulty correctly identifying skin cancers in photographs. In a similar study that only 12% of 105 non-dermatologists were able to diagnose 5 of 6 melanomas presented as photographs (compared to 69% of dermatologists) (20). In the same study only 38% of primary care physicians correctly diagnosed 4 of the 6 melanomas (20). An additional study that used pictures of lesions found that primary care physicians correctly diagnosed melanoma 50% of the time (27). Bedlow and Ward have also documented knowledge and diagnostic deficiencies in primary care physicians (28-29).

This study contributes to the growing literature supporting a lack of knowledge and diagnostic ability about skin cancer in many primary care physicians. This may lead to fewer activities for prevention and early detection of skin cancer. Physicians who do not know risk factors may not accurately risk stratify their patients. Physicians who are not confident in their ability to diagnose skin lesions may be less likely to examine the skin. We found that participants who had a clinical dermatology rotation of greater than 2 weeks had higher levels of knowledge about skin cancer. Finding ways to include more exposure to dermatology during residency training may be an important step in improving physicians' abilities. CME activities, such as this educational module, may also be important for practicing physicians.

This study also showed that a brief educational module could increase primary care physicians' knowledge and diagnostic abilities. It also changed self-reported skin cancer prevention behaviors. Similar educational interventions have been attempted with mixed results. Much of this curriculum was based on work by Martin Weinstock, MD, PhD (30-32), who showed significant increases in provider self-reported skin cancer control practices during an initial visit with an new patient and during a routine visit with a high risk patient following a similar 2-hour curriculum (31). In his similar but smaller study (22 participants) self-reported behavior by the participants was confirmed by exit interviews with patients. This showed that participants self-reports were reliable in this setting and agreed with patients' reports. They also showed increases in diagnostic ability and triage practices following the similar 2-hour curriculum (32). Other interventions have not been as successful. Dolan only found modest effects on skin cancer control attitudes, beliefs, knowledge, and behaviors following a brief educational intervention that was presented to internal medicine housestaff and faculty in one large academic setting (33). The difference between the positive results garnered by us and Weinstock and the negative results from Dolan may be attributed to the nature of the educational module. We based much of our curriculum on the one developed by Weinstock. The module used by Dolan is not discussed thoroughly in the paper. One difficulty in educating busy physicians is finding a time that is optimum for many of them to congregate. Some researchers have dealt with this by developing 'internet based' educational modules. One on-line education class caused significant improvement in physician confidence,

knowledge, and skills related to skin cancer prevention and early detection (34). This study adds to the growing literature that educational interventions targeted to increase physician knowledge, attitudes, and behavior with regards to skin cancer prevention and early detection can be successful.

The limitations of this study include the background of the participants, the drop-out rate, and follow-up time. The participants were mainly composed of medical residents in family medicine and internal medicine residency programs in North Carolina. They were chosen because they were a convenient sample. Optimally one would like to survey the knowledge, attitudes, and behaviors of actual primary care physicians who have completed training and are practicing in the community. However, it is difficult to bring together a large number of practicing physicians for an intervention. Another limitation is the large drop-out rate. Of the 174 participants who completed the initial survey, only 88 (51%) completed the follow up survey. There may be a selection bias as to which participants chose to fill out the follow up survey. Optimally one would want a much higher follow-up rate. A third limitation is follow-up time. The follow-up surveys were given 2-4 weeks following the initial visit. The changes found in the intervention group at follow-up may not be lasting. Longer follow-up time using similar interventions are needed. An additional limitation is that the behaviors of primary care physicians were self-reported.

Further research is needed in assessing knowledge and behaviors of primary care physicians with regard to skin cancer prevention and detection. Specifically, the ability of primary care physicians to appropriately risk stratify patients and

correctly identify cancerous, pre-cancerous, and benign lesions must be explored. If continued deficiencies in these areas continue to appear, more research must be applied to better educate primary care physicians in these areas. Additionally further research is needed in development and testing of educational modules. We need to know what aspects of our curriculum and Weinstock's curriculum make them effective where as Dolan's curriculum was not. We also need to learn the best way to get effective educational modules to many practicing physicians. Lastly, further research is needed to determine the effectiveness of screening and counseling for early detection and prevention of skin cancer. Whether primary care physicians should be actively screening or counseling their patients with regard to skin cancer is not known. However, primary care physicians should possess general skin cancer knowledge and the ability to diagnose benign, cancerous, and precancerous lesions.

Conclusion:

Primary care resident physicians possess inadequate knowledge, diagnostic skills, and preventive behaviors with regard to skin cancer prevention and early detection; these deficits can be improved in the short term using a brief educational intervention.

TABLE 1.

Characteristics of All Participants Completing Initial Baseline Survey

Characteristic	Number (%)
Level of Training	1st year resident 54(32%) 2nd year resident 43(25%) 3rd year resident 41(24%) 4th year resident 6(4%)5th year resident 2(1%) Attending 9(5%) Medical Student 15(9%)
Residency Program Setting	Academic: 80(46%) Community: 94(54%)
Residency Program Type	Internal Medicine: 131(75%) Family Medicine: 43(25%)
Sex	Male: 106(62%) Female: 66(38%)
Had a Clinical Dermatology Rotation > 2 weeks	Yes: 78(45%) Medical Student: 47(27%) Resident: 19(11%) Both: 12(7%) No: 94(55%)
Anticipate Having a Clinical Dermatology Rotation > 2 weeks prior to completing training	Yes: 86(50%) No: 85(50%)
Career	Primary Care 87(51%) Specialized/ Undecided 84(49%)

TABLE 2

Baseline Survey Results: Basic Skin Cancer Knowledge

Question	Answers:	number (%)
1. What is the most common cancer to present to a primary care physician?	a. Lung	20(11.63)
	b. Breast	3(1.74)
	c. Colon	3(1.74)
	d. Skin	**146(84.88)**
2. Which of the following is a pre-cancerous lesion?	a. Seborrheic keratosis	8(4.68)
	b. Dermatofibroma	1(0.58)
	c. Actinic keratosis	**145(84.8)**
	d. Café-au-lait spot	1(0.58)
	e. Dermal nevus	16(9.36)
3. What is the most common type of skin cancer?	**a. Basal cell**	**104(59.77)**
	b. Squamous cell	58(33.33)
	c. Dermatofibroma	0(0)
	d. Melanoma	12(6.90)
4. What is the lifetime risk of developing melanoma in the year 2000?	a. 1/34	24(14.04)
	b. 1/74	**48(28.07)**
	c. 1/100	66(38.60)
	d. 1/194	33(19.30)
5. What is the 5-year survival rate for a melanoma that is less that 1 mm thick?	a. 40%	0(0)
	b. 50%	10(5.75)
	c. 80%	59(33.91)
	d. 95%	**105(60.34)**
6. What is the 5-year survival rate for a primary melanoma lesion that is > 4 mm thick without known metastasis?	a. 30%	79(45.66)
	b. 50%	**63(36.42)**
	c. 75%	28(16.18)
	d. 90%	3(1.73)

TABLE 3

Baseline Survey Results: Diagnostic Ability and Decision Making

Question:	Answers:	Number (%)
7a. 40 year old caucasian male with a lesion on his shoulder. (picture A) What is the most likely diagnosis?	a. Seborreic Keratosis	9(5.2)
	b. Basal Cell	10(5.78)
	c. Angioma	0(0)
	d. Melanoma	**100(57.8)**
	e. Nevus	54(31.2)
7b. What would you do next?	**a. Act**	**127(73.84)**
	b. Reassure	8(4.65)
	c. Track	36(20.93)
	d. Cryotherapy	1(0.58)
8a. 50 year old male with lesion on his face. (picture B) What is the most likely diagnosis?	a. Seborreic Keratosis	6(3.45)
	d. Basal Cell	**152(87.36)**
	e. Angioma	4 (2.30)
	d. Melanoma	2 (1.15)
	e. Actinic Keratosis	10 (5.75)
8b. What would you do next?	**a. Act**	**146(83.91)**
	d. Reassure	3(1.72)
	e. Track	7(4.02)
	d. Cryotherapy	18(10.34)
9a. 35 year old woman with lesion on her hand. (picture C) What is the most likely diagnosis?	a. Seborreic Keratosis	12(6.90)
	b. Basal Cell	0(0)
	c. Angioma	1(0.57)
	d. Melanoma	7(4.02)
	e. Nevus	**154(88.51)**
9b. What would you do next?	a. Act	11(6.32)
	b. Reassure	**91(52.3)**
	c. Track	71(40.86)
	d. Cryotherapy	1(0.57)
10a. 45 year old woman with lesion on her arm. (picture D) What is the most likely diagnosis?	a. Seborreic Keratosis	4(2.31)
	d. Basal Cell	6(3.47)
	e. Angioma	71(41.04)
	d. Melanoma	**56(32.37)**
	e. Nevus	36(20.8)
10b. What would you do next?	**a. Act**	**81(46.82)**
	b. Reassure	28(16.18)
	c. Track	59(34.10)
	d. Cryotherapy	5(2.89)
11a. 55 year old male with lesion on his back. (picture E) What is the most likely diagnosis?	**a. Seborreic Keratosis**	**116(67.05)**
	f. Basal Cell	9(5.20)
	g. Angioma	1(0.58)
	d. Melanoma	15(8.67)
	e. Actinic Keratosis	32(18.5)
11b. What would you do next?	a. Act	42(24.71)
	b. Reassure	**77(45.29)**
	c. Track	26(15.29)
	d. Cryotherapy	25(14.71)
12a. 47 year old woman with lesion on her leg. (picture F) What is the most likely diagnosis?	a. Seborreic Keratosis	0(0)
	h. Basal Cell	3(1.72)
	i. Angioma	13(7.47)
	d. Melanoma	**140(80.46)**
	e. Nevus	18(10.34
12b. What would you do next?	**j. Act**	**152(87.86)**
	d. Reassure	1(0.58)
	e. Track	19(10.98)
	d. Cryotherapy	1(0.58)

TABLE 4

Baseline Survey Results: Knowledge of the ABCD's of Melanoma

Physical exam characteristic of melanoma:	Number Correct (%) (N=)
Assymetry	54(93)
Border irregularity	89(154)
Color variation	89(154)
Diameter > 6 mm	75(129)

TABLE 5

Baseline Survey Results: Knowledge of Skin Cancer Risk Factors

Risk Factor for Skin Cancer	Number	%
Excessive sun exposure	167	96.63
Personal history of skin cancer	42	24.28
Family history of skin cancer	114	65.90
Genetic diseases (albinism, xeroderma pigmentosa, basal cell nevoid syndrome)	34	19.65
High number (>50) nevi	10	5.78
Fair skin	99	57.23
History of blistering sunburns	50	28.90
Immunosuppression (HIV, chemotherapy)	13	7.51
Large congenital nevi	4	2.71
Dysplasti/Atypical nevus	9	5.20
Actinic keratosis	14	8.09
Lentigo maligna	3	1.73

TABLE 6

Baseline Survey Results: Attitudes Toward Skin Cancer Prevention and Detection

1=Disagree 2=Somewhat Disagree 3=Neutral 4=Somewhat Agree 5=Agree

Statement	Mean	SD
16. Time is a limiting factor in skin cancer prevention and early detection.	3.63	1.26
17. Lack of education is a limiting factor in skin cancer prevention and early detection.	4.09	1.00
18. Total body self exam (TBSE) is effective	3.92	.99
19. Patients do not appreciate efforts to provide information on TBSE	2.44	1.05
20. Early detection of skin cancer can improve morbidity	4.70	.56
21. Early detection of skin cancer can improve mortality.	4.72	.61
22. Physicians cannot be effective in helping patients decrease skin cancer risk.	1.34	.60
23. Patients want counseling about skin cancer prevention.	3.92	.81
24. Physician advice is one of the best ways of influencing a patient's decision to reduce their risk.	3.93	.93
25. Physician counseling about skin cancer cannot save lives	1.53	.66
26. I am confident in my ability to diagnose skin lesions	2.62	1.07

TABLE 7

Baseline Survey Results: Physician Behavior at a Visit with a "High-Risk" Patient

1=Never 2=Infrequently 3=Sometimes 4=Often 5=Almost Always

Statement	Mean	SD
27. I perform a total body skin exam	2.53	.98
28. I ask about use of sunscreen	2.62	1.05
29. I advice and counsel about skin cancer risk	2.72	1.00
30. I provide resource materials on skin cancer	2.61	.94

TABLE 8

Baseline Survey Results: Physician Behavior at a Visit with a "New" Patient

1=Never 2=Infrequently 3=Sometimes 4=Often 5=Almost Always

31. I ask patients if they regularly examine their skin for growths or changes in lesions.	2.40	.93
32. I ask about a personal history of melanoma.	2.45	1.03
33. I ask about a family history of melanoma.	2.47	1.02
34. I ask about history of tanning bed use.	2.03	.96
35. I ask if patients use sunscreen regularly.	2.44	1.02
36. I ask about a history of blistering sunburns.	2.55	.91
37. I provide written materials about skin cancer prevention.	1.77	.83
38. I advise use of sunscreen.	2.88	1.09
39. I advise to avoid midday sun exposure	2.37	1.06
40. I advise to use hats and other protective clothing	2.59	1.02
41. I advise to perform regular skin examination for growth or changes in spots.	2.66	1.01

TABLE 9

Follow-Up Survey Results: Basic Skin Cancer Knowledge

	Baseline	Follow-Up
	%Correct Intervention Control p value	%Correct Intervention Control p value
Question		
1. What is the most common cancer to present to a primary care physician?	85 89 NS	88 89 NS
2. Which of the following is a pre-cancerous lesion?	93 93 NS	100 93 NS
3. What is the most common type of skin cancer?	52 71 (.08)	69 77 NS
4. What is the lifetime risk of developing melanoma in the year 2000?	28 22 NS	61 31 (.005)
5. What is the 5-year survival rate for a melanoma that is less that 1 mm thick?	73 53 (.07)	83 51 (.002)
6. What is the 5-year survival rate for a primary melanoma lesion that is > 4 mm thick without known metastasis?	35 37 NS	52 33 (.08)

(p value for fisher's exact test) NS=non significant

TABLE 10

Follow-Up Survey Results: Diagnostic Ability and Decision Making

	Baseline	Follow-Up
	%Correct Intervention Control p value	%Correct Intervention Control p value
Question		
7a. 40 year old caucasian male with a lesion on his shoulder. (picture A) What is the most likely diagnosis?	69 53 NS	73 37 (.001)
7b. What would you do next?	83 77 NS	83 60 (.019)
8a. 50 year old male with lesion on his face. (picture B) What is the most likely diagnosis?	97 95 NS	95 91 NS
8b. What would you do next?	78 91 NS	83 88 NS
9a. 35 year old woman with lesion on her hand. (picture C) What is the most likely diagnosis?	83 89 NS	83 86 NS
9b. What would you do next?	64 47 NS	52 40 NS
10a. 45 year old woman with lesion on her arm. (picture D) What is the most likely diagnosis?	30 35 NS	29 29 NS
10b. What would you do next?	45 53 NS	38 40 NS
11a. 55 year old male with lesion on his back. (picture E) What is the most likely diagnosis?	69 77 NS	67 80 NS
11b. What would you do next?	55 44 NS	47 46 NS
12a. 47 year old woman with lesion on her leg. (picture F) What is the most likely diagnosis?	78 80 NS	92 80 (.12)
12b. What would you do next?	87 93 NS	95 86 NS

(p value for fisher's exact test) (NS=Non-significant)

TABLE 11

Follow-Up Survey Results: Knowledge of the ABCD's of Melanoma

	Baseline	Follow-Up
	%Correct Intervention Control p value	%Correct Intervention Control p value
Physical Exam Characteristics of Melanoma		
Assymetry	64 62 NS	78 60 NS
Border irregularity	95 91 NS	93 86 NS
Color variation	85 88 NS	95 84 NS
Diameter > 6 mm	64 80 NS	75 66 NS

NS=Non-significant

TABLE 12

Follow-Up Survey Results: Risk Factors for Skin Cancer

	Baseline	Follow-Up
	%Correct Intervention Control p value	%Correct Intervention Control P value
Excessive sun exposure	95 95 NS	95 100 NS
Personal history of skin cancer	26 22 NS	55 33 (.05)
Family history of skin cancer	69 71 NS	67 62 NS
Genetic diseases (albinism, xeroderma pigmentosa, basal cell nevoid syndrome)	11 20 NS	12 15 NS
High number (>50) nevi	7 4 NS	30 6 (.009)
Fair skin	61 68 NS	72 60 NS
History of blistering sunburns	40 33 NS	62 31 (.005)
Immunosuppression (HIV, chemotherapy)	2 6 NS	7 6 NS
Large congenital nevi	4 0 NS	13 2 (.09)
Dysplasti/Atypical nevus	2 6 NS	33 2 (.0001)
Actinic keratosis	9 11 NS	23 6 (.05)
Lentigo maligna	2 0 NS	13 2 (.09)

(p=fisher's exact test) (NS=Non-significant)

TABLE 13

Follow-Up Survey Results: Attitudes Toward Skin Cancer Prevention and Detection

1=Disagree 2=Somewhat Disagree 3=Neutral 4=Somewhat Agree 5=Agree

	Baseline Data: Mean (SD)		Follow Up Data: Mean (SD)	
Statement	Intervention	Control	Intervention	Control
16. Time is a limiting factor in skin cancer prevention and early detection.	3.47 (1.28)	3.62 (1.34)	3.70 (1.06)	3.75 (1.05)
17. Lack of education is a limiting factor in skin cancer prevention and early detection.	3.77 (1.11)	4.1 (1.04)	3.93 (.91)	4.02 (.87)
18. Total body self exam (TBSE) is effective	3.58 (1.14)	3.89 (1.03)	4.11 (.88)	3.97 (.84)
19. Patients do not appreciate efforts to provide information on TBSE	2.33 (1.00)	2.35 (1.09)	2.16 (.87)	2.16 (.90)
20. Early detection of skin cancer can improve morbidity	4.63 (.76)	4.73 (.44)	4.64 (.58)	4.69 (.47)
21. Early detection of skin cancer can improve mortality.	4.65 (.78)	4.77 (.56)	4.71 (.60)	4.69 (.60)
22. Physicians cannot be effective in helping patients decrease skin cancer risk.	1.47 (.74)	1.22 (.51)	1.60 (.87)	1.49 (.66)
23. Patients want counseling about skin cancer prevention.	3.91 (.89)	3.87 (.84)	3.88 (.87)	3.88 (.80)
24. Physician advice is one of the best ways of influencing a patient's decision to reduce their risk.	3.95 (.95)	3.89 (.93)	4.20 (.76)	3.93 (.86)
25. Physician counseling about skin cancer cannot save lives	1.70 (.74)	1.49 (.69)	1.65 (.72)	1.64 (.71)
26. I am confident in my ability to diagnose skin lesions	2.91 (1.04)	2.96 (1.07)	3.33** (.96)	2.98** (1.02)

**p value < .10 for follow-up intervention versus control score

TABLE 13A

Follow-Up Survey Results: Attitudes Toward Skin Cancer Prevention and Detection

1=Disagree 2=Somewhat Disagree 3=Neutral 4=Somewhat Agree 5=Agree

	Change in Response: Mean (SD)		Difference of Change: Significance of Change	
Statement	Intervention	Control	Difference	P value <
16. Time is a limiting factor in skin cancer prevention and early detection.	.23 (1.32)	.13 (1.32)	.10	.73
17. Lack of education is a limiting factor in skin cancer prevention and early detection.	.16 (1.17)	-.06 (1.1)	.23	.34
18. Total body self exam (TBSE) is effective	.53 (.98)	.09 (1.12)	.45	.05*
19. Patients do not appreciate efforts to provide information on TBSE	-.19 (80)	-.2 (1.12)	.009	.96
20. Early detection of skin cancer can improve morbidity	-.09 (1.12)	-.04 (.60)	-.05	.81
21. Early detection of skin cancer can improve mortality.	.1 (.81)	-.01 (.82)	.189	.28
22. Physicians cannot be effective in helping patients decrease skin cancer risk.	.18 (.79)	.27 (.54)	-.08	.58
23. Patients want counseling about skin cancer prevention.	-.02 (.83)	.02 (.89)	-.05	.80
24. Physician advice is one of the best ways of influencing a patient's decision to reduce their risk.	.23 (1.02)	.04 (.73)	.19	.32
25. Physician counseling about skin cancer cannot save lives	-.05 (.75)	.15 (.79)	-.20	.225
26. I am confident in my ability to diagnose skin lesions	.43 (.95)	.03 (.89)	.40	.047*

TABLE 14

Follow-Up Survey Results: Physician Behavior at a Visit with a "High-Risk" Patient

1=Never 2=Infrequently 3=Sometimes 4=Often 5=Almost Always

	Baseline Data: Mean (SD)		Follow Up Data: Mean (SD)	
Statement	Intervention	Control	Intervention	Control
27. I perform a total body skin exam	2.68 (.89)	2.53 (.97)	2.67* (.99)	2.24* (.70)
28. I ask about use of sunscreen	2.83 (.97)	2.44 (.94)	3.09* (.92)	2.4* (.89)
29. I advice and counsel about skin cancer risk	2.95 (.98)	2.59 (.92)	3.19* (.86)	2.62* (.96)
30. I provide resource materials on skin cancer	2.02 (.91)	1.84 (.76)	2.32* (.92)	1.71* (.69)

*p value < .05 for follow-up intervention versus control score

TABLE 14A

Follow-Up Survey Results: Physician Behavior at a Visit with a "High-Risk" Patient

1=Disagree 2=Somewhat Disagree 3=Neutral 4=Somewhat Agree 5=Agree

	Change in Response: Mean (SD)		Difference of Change: Significance of Change	
Statement	Intervention	Control	Difference	P value <
27. I perform a total body skin exam	0 (.90)	-.28 (.94)	.288	.15
28. I ask about use of sunscreen	.25 (.93)	-.04 (.93)	.30	.13
29. I advice and counsel about skin cancer risk	.16 (1.21)	.02 (.76)	.14	.50
30. I provide resource materials on skin cancer	.3 (1.03)	-.13 (.73)	.44	.02*

TABLE 15

Follow-Up Survey Results: Physician Behavior at a Visit with a "New" Patient

1=Never 2=Infrequently 3=Sometimes 4=Often 5=Almost Always

	Baseline Data: Mean (SD)		Follow Up Data: Mean (SD)	
Statement	Intervention	Control	Intervention	Control
31. I ask patients if they regularly examine their skin for growths or changes in lesions.	2.6 (.85)	2.47 (1.07)	2.83 (.84)	2.53 (.96)
32. I ask about a personal history of melanoma.	2.67 (.94)	2.31 (.97)	2.95* (.99)	2.47* (1.01)
33. I ask about a family history of melanoma.	2.73 (.91)	2.46 (1.03)	2.93* (1.03)	2.47* (1.01)
34. I ask about history of tanning bed use.	2.21 (1.06)	2.11 (.88)	2.60* (.82)	2.06* (.75)
35. I ask if patients use sunscreen regularly.	2.65 (.97)	2.4 (1.03)	2.80** (.93)	2.44** (1.06)
36. I ask about a history of blistering sunburns.	2.18 (.95)	1.88 (.75)	2.53** (.91)	2.2** (.94)
37. I provide written materials about skin cancer prevention.	1.85 (.78)	1.64 (.77)	2.07* (.83)	1.64* (.68)
38. I advise use of sunscreen.	3.01 (.99)	2.76 (1.11)	3.25* (1.00)	2.78* (1.06)
39. I advise to avoid midday sun exposure	2.79 (1.01)	2.13 (1.01)	3.09* (.92)	2.37* (1.01)
40. I advise to use hats and other protective clothing	2.95 (.95)	2.53 (1.12)	3.11** (.98)	2.47** (1.07)
41. I advise to perform regular skin examination for growth or changes in spots.	2.86 (.94)	2.75 (1.09)	3.2* (.94)	2.74* (1.02)

TABLE 15A

Follow-Up Survey Results: Physician Behavior at a Visit with a "New" Patient

1=Never 2=Infrequently 3=Sometimes 4=Often 5=Almost Always

	Change in Response: Mean (SD)		Difference of Change: Significance of Change	
Statement	Intervention	Control	Difference	P value <
31. I ask patients if they regularly examine their skin for growths or changes in lesions.	.23 (.78)	.06 (.83)	.17	.34
32. I ask about a personal history of melanoma.	.28 (1.0)	.15 (.97)	.12	.56
33. I ask about a family history of melanoma.	.17 (.19)	-.03 (1.0)	.2	.34
34. I ask about history of tanning bed use.	.39 (.876)	-.04 (.60)	.44	.007*
35. I ask if patients use sunscreen regularly.	.15 (.77)	.04 (.90)	.11	.55
36. I ask about a history of blistering sunburns.	.35 (.92)	.31 (.76)	.04	.83
37. I provide written materials about skin cancer prevention.	.24 (.79)	0 (.82)	.24	.17
38. I advise use of sunscreen.	.18 (.87)	.02 (.75)	.16	.35
39. I advise to avoid midday sun exposure	.30 (.91)	.24 (.80)	.06	.75
40. I advise to use hats and other protective clothing	.16 (.92)	-.05 (.77)	.21	.23
41. I advise to perform regular skin examination for growth or changes in spots.	.34 (1.04)	-.01 (.88)	.36	.08**

Appendix 1

- "Skin Cancer Early Detection and Prevention for the Primary Care Physician" presentation handout
- Basic Skin Cancer Triage Algorithm
- Self Administered Melanoma Risk Stratification Questionnaire
- "Why You Should Know About Melanoma": Pamphlet from the American Cancer Society

Skin Cancer Prevention and Early Detection: Strategies and Skills

Jeremy Bordeaux,
MD,MPH (expected 5/02)
Cristy Parker,
MD,MPH (expected 5/02)

Rationale
What are we doing here?

- Primary Care Physicians have difficulty diagnosing skin cancer
  - Accuracy of skin cancer diagnosis by specialty
    - Dermatologists 93%
    - Family Medicine Physicians 70%
    - Internal Medicine Physicians 52%
  - Physicians' diagnostic skills
    - Only 38% of primary care physicians correctly identified 4 or more of 6 melanomas
    - 17% of these physicians categorized their training in this area as excellent or good

Rationale
What are we doing here?

- Primary Care Physicians are not screening high risk patients for skin cancer
  - Family Physicians performed skin examinations on these patients 27% of the time
  - Internal Medicine Physicians performed skin examinations on these patients 0% of the time

Rationale
What are we doing here?

- Primary Care Physicians are not counseling high risk patients about skin cancer prevention
  - Family Physicians counseled high risk patients 24% of the time
  - Internal Medicine Physicians counseled high risk patients 7.7% of the time

Rationale
What are we doing here?

- **Primary Care Physicians in NC want to be educated about skin cancer detection and prevention**
  - 1999 survey done by the North Carolina Advisory Committee on Cancer Coordination and Control

Goals
What do we want you to learn?

- Skin Cancer prevention and detection is important
- GOALS of Presentation
  - Increase primary care physicians' **knowledge** about skin cancer
  - Increase primary care physicians' **skills** in primary and secondary prevention strategies
  - Improve primary care physicians' **attitudes** about putting skin cancer prevention into practice

Epidemiology Melanoma

- Malignant melanoma is increasing in incidence more rapidly than any other cancer.
- Current data estimates that in the year 2000 1 in 74 in the United States will develop malignant melanoma in their lifetime,
  - compared with 1 in 1500 in 1935.

Epidemiology Melanoma

- At the current rate, the incidence of melanoma will DOUBLE every decade
- It is believed that the incidence of melanoma is UNDER-reported by 20%
- It is estimated that the cost for treating melanoma will be greater than $5 billion in the year 2000

Epidemiology Melanoma

- Death from melanoma may occur relatively early in adult life
  - Most common cause of cancer: 25-29 yrs
  - Second leading cause of years of life loss to any adult-onset cancer
- Long term survival in people with metastasis is dismal
  - Chemotherapy has poor results

What is the good news?

- Morbidity and Mortality from skin cancer can be reduced by your actions
- Secondary Prevention (Early Detection)
  - 5-year survival rate is estimated as
    - > 96% for melanomas that are thin (<0.75mm deep)
    - 47% for those that are thicker (>4mm deep)
- Primary Prevention (Counseling, Education)

Secondary Prevention ***Early Detection***

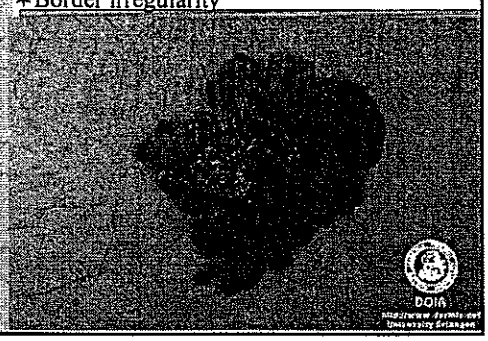
- What does skin cancer look like?
- What do benign lesions that may be mistaken for skin cancer look like?
- What do pre-cancerous lesions look like?

Secondary Prevention Early Detection

- Primary Care Physicians have difficulty diagnosing skin cancer
  - Accuracy of skin cancer diagnosis by specialty
    - Dermatologists 93%
    - Family Medicine Physicians 70%
    - Internal Medicine Physicians 52%
  - Physicians' diagnostic skills
    - Only 38% of primary care physicians correctly identified 4 or more of 6 melanomas
    - 17% of these physicians categorized their training in this area as excellent or good

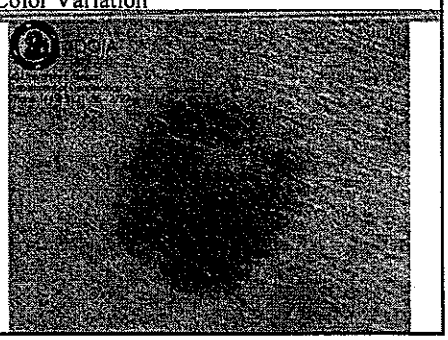
Secondary Prevention
What does skin cancer look like?

✶Border irregularity



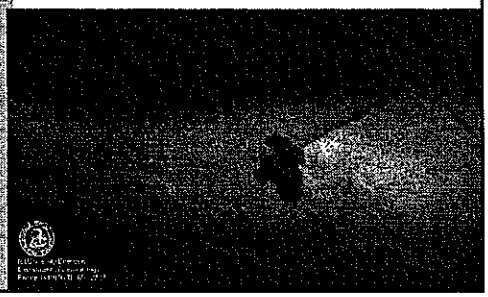
Secondary Prevention
What does skin cancer look like?

✶Color Variation



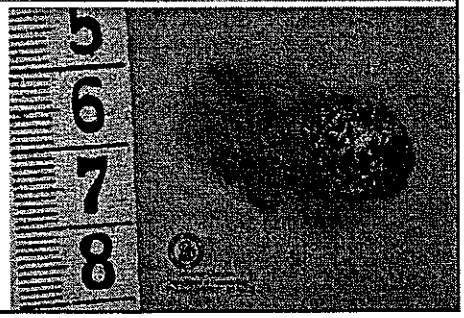
Secondary Prevention
What does skin cancer look like?

✶Diameter >6mm



Secondary Prevention
What does skin cancer look like?

✶Elevation/Enlargement



Secondary Prevention
What does skin cancer look like?

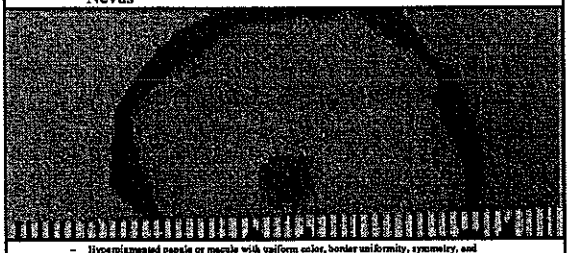
✶Differential Diagnosis for Melanoma:

- Nevus
- Seborrheic keratosis
- Pigmented basal cell carcinoma
- Actinic (solar) lentigo
- Angioma
- Dermatofibroma
- Freckles/Café-au-lait spot

Secondary Prevention
What does skin cancer look like?

✶Differential Diagnosis for Melanoma:

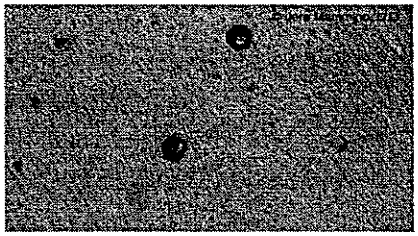
- Nevus



- Hyperpigmented papule or macule with uniform color, border uniformity, symmetry, and usually < 6 mm. May also be skin colored or have hair growin from within

Secondary Prevention
What does skin cancer look like?

* Differential Diagnosis for Melanoma:
  - Cherry Angioma



Smooth, dome shaped red papule

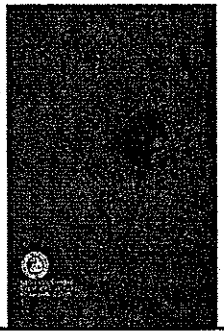
Secondary Prevention
What does skin cancer look like?

* Differential Diagnosis for Melanoma:
  - Dermatofibroma

Benign area of focal dermal fibrosis

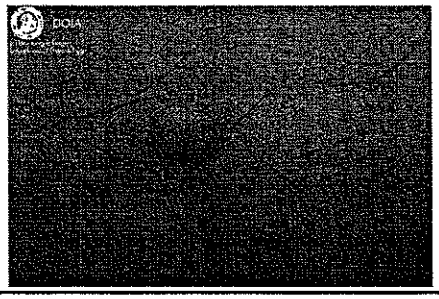
Slow growing round to oval firm nodule with a dermal component that is small with well demarcated borders.

Lateral compression causes the "dimple" sign



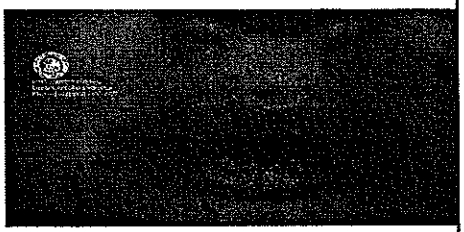
Secondary Prevention
What does skin cancer look like?

* Differential Diagnosis for Melanoma:
  - Dermatofibroma



Secondary Prevention
What does skin cancer look like?

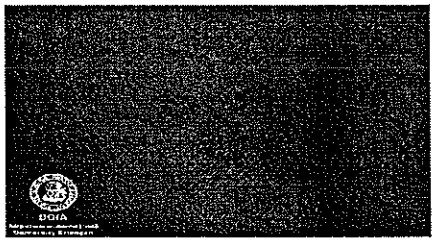
* Differential Diagnosis for Melanoma:
  - Freckles/Ephelides



Small hyperpigmented macule found on sun exposed areas of the skin
Large numbers of freckles are associated with increased risk of melanoma

Secondary Prevention
What does skin cancer look like?

* Differential Diagnosis for Melanoma:
  - Café-au-lait spot



- well circumscribed large (2-20mm) tan macules
- 10-15% of the population will have one

Secondary Prevention
What does skin cancer look like?

* Precursor lesions of malignant melanoma
  - Dysplastic nevus
  - Large congenital nevi
  - Lentigo maligna
* Precursor lesions of squamous cell carcinoma
  - Actinic keratosis

Secondary Prevention Screening

- Screening Controversies:
  - Should screening be done?
  - Who should do the screening?
  - Who should be screened?
  - How often should screening be done?

Secondary Prevention Screening Recommendations

Group	Screening method	Frequency
American Academy of Dermatology	✱Self-examinations ✱Complete skin exam by physician	✱Periodically ✱Annually
American Cancer Society	✱Self-examinations ✱Complete skin exam by physician	✱Every month ✱Age 20-39: q3 yrs Age >39: annually
U.S. Preventative Services Task Force	✱Insufficient evidence to recommend for or against routine skin examinations	✱N/A
American Academy of Family Physicians	✱Self-examination ✱Complete skin exam by a physician for high risk persons	✱Every six months ✱Periodic

Secondary Prevention Screening

- Compelling rationale to screen for skin cancer:
  - Increasing incidence and mortality rate
  - Long asymptomatic period during which curability is high
    - 99% of melanomas found through physician screening are <1.5 cm, which lends to much better prognosis for these patients
    - Early removal can reduce morbidity/mortality
  - An acceptable, safe, and inexpensive screening test exists (the skin exam)

Secondary Prevention Screening: Current Evidence

- No studies have clearly shown that screening the **general population** for skin cancer is beneficial or cost-effective.
- Recent studies have shown that screening programs targeting **high-risk** individuals can have beneficial effects and are cost-effective.

Secondary Prevention Screening: Current Evidence

- Skin cancer screening for high risk patients is cost-effective
  - Analysis by Freedberg et al. showed that physician screening of high risk patients cost
    - **$29, 170 per Year of Life Saved (YLS)**
  - For comparison, screening with
    - Pap smear every three years **costs $46, 410/YLS**
    - Mammogram every year for women age 55-65 **costs $32, 130/YLS**

Secondary Prevention Who is at risk?

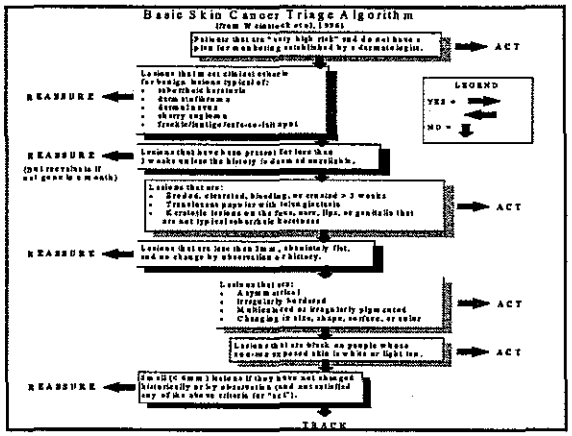
- "Very High Risk":
  - Personal history of skin cancer (RR 2-8)
  - Family history of skin cancer (RR 2-8)
  - Personal history of precursor lesions: (RR 7-70)
    - Large congenital nevus (>.5cm)
    - Dysplastic/atypical nevus
    - Lentigo maligna
    - Actinic keratosis

Secondary Prevention
Decision Making

- The ART of Basic Skin Cancer Triage
- Algorithm developed by Martin Weinstock, MD, PhD to help physicians triage patients with skin lesions

Secondary Prevention
Decision Making

- When presented with a lesion, there are 3 broad actions that a physician can take
  - ACT: Further evaluation needed
    - Biopsy in office, consider referral to a dermatologist, establish a monitoring plan
  - REASSURE: Give patient general advice about skin cancer and early detection
  - TRACK: Reevaluate at a later time to see if lesion has changed



Secondary Prevention
Conclusions

- Early detection is a crucial element in decreasing the morbidity and mortality from skin cancer
- Screening high risk patients can have beneficial effects and is cost-effective
- Applying the Basic Skin Cancer Triage Algorithm can aid primary care physicians in decision making

PRIMARY PREVENTION:
Goals

- Increase patient knowledge
- Change patient attitudes
- Improve patient behaviors
- Decrease morbidity and mortality

Primary Prevention:
Current Knowledge

- Patients know very little about skin cancer (1995 survey)
  - Only 1/3 of the adults knew melanoma was a skin cancer
  - 50% of men and 35% of women did not know the term melanoma
  - Only 26% of the adults knew early signs of melanoma
- There are many misconceptions about sun exposure and skin cancer
  - Adults often think there is not risk from the sun during the winter.
  - Many adults believe that sun exposure is not harmful if you gradually tan to "build-up resistance."
  - Many adults believe that tanning beds are a "safe" way to tan.

Primary Prevention: PHYSICIAN RESPONSIBILTY

- Patients have shown interest in counseling from physicians
- Physician counseling has been shown to reduce patient tanning practices
- Physician counseling has also been shown to increase the use of protective clothing by patients

Putting Prevention into Practice

- Barriers to Screening and Counseling:
  - Lack of time
  - Lack of expertise
  - Distraction by other health issues
  - Lack of positive feedback
  - Perception of inadequate reimbursement for time spent on preventive care

Putting Prevention into Practice

- Targeting High Risk Patients
- Prevention Systems

Putting Prevention into Practice Identifying "high risk" groups

- RISK FACTORS:
  - **AGE**
  - **Cumulative sun exposure**
  - **Fair skin**
  - **History of blistering sun burns**
  - **Family or personal history of skin cancer**
  - **Precursor Lesions→Dysplastic Nevi**
  - **Large number of common moles**
  - **Freckles**
  - **Exposure to UV radiation**
  - **Immune suppression**

Putting Prevention into Practice Identifying "high risk" groups

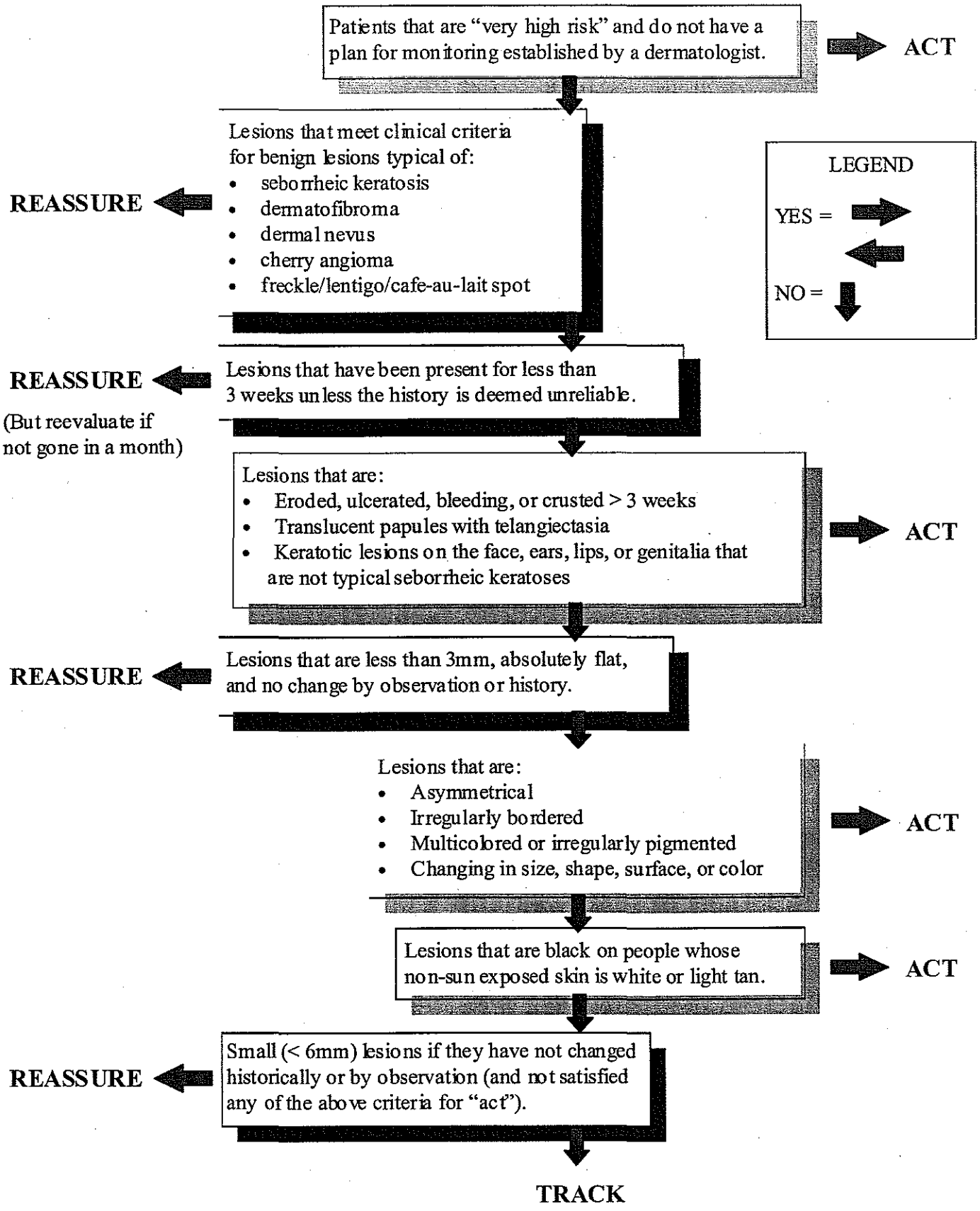
- MacKie Questionnaire: Patients can identify *themselves*
  - Four independent risk factors
    - 1- Freckling
    - 2- > 20 moles on skin
    - 3- presence of atypical nevi
    - 4- history of episodes of severe sunburns
  - A score of > = 3 places the patient in a 'high risk' category
  - High risk patients should have total skin exam, counseling, and follow up
- Physician identification during new patient interviews

Putting Prevention into Practice: Prevention Systems

- "Once I identify high risk patients and proceed with the TSE and counseling (and/or referral), how do I track them?"
- "Flagging" high risk patients
  - Problem lists
  - Stickers
  - Reminders on computerized systems

Basic Skin Cancer Triage Algorithm

(from Weinstock et al, 1996)



The ART of Basic Skin Cancer Triage

ACT:

Further evaluation needed (e.g. refer to dermatologist, biopsy, counseling or other intervention.)

REASSURE:

Give patient general advice regarding skin cancer prevention and early detection.

TRACK:

Reevaluate at 2 months and again at 6 months. If change occurs before or at scheduled follow-up, then "ACT". Annual follow-up is indicated in the absence of a monitoring plan established by a dermatologist. Photography may be helpful. Encourage patient to return for reevaluation promptly if any change is noted.

Very high risk:*

Personal history of melanoma, eight moles at least 6mm in diameter, or more than one genetically related family member with melanoma.

Changing:

Changing in size, shape, surface, or color within the past year. This includes new lesions and excludes 1) slight increase in size of multiple moles in children or on expanding body parts (e.g. the abdomen of pregnant woman) and 2) similar concurrent darkening of multiple moles (e.g. with tanning or pregnancy). Simultaneous changes in size or color of multiple moles, from benign causes influence all moles in the affected area.

Benign, typical of seborrheic keratosis:

Keratotic; sharp border; raised, typically appears "stuck-on"; horn cysts or milia-like cysts.

Benign, typical of dermatofibroma:

Firm papule, tan or light brown surface gradually fading into normal skin, completely symmetric and regular, diameter < 1cm, skin dimples downward with lateral compression (dermatofibromas are most frequent on thigh and legs).

Benign, typical of dermal nevus:

Soft, round or oval, and dome-shaped; sharply circumscribed; flesh colored; diameter < 1cm.

Benign, typical of freckle/lentigo/cafe-au-lait:

Completely flat, uniform tan color.

Benign, typical of cherry angioma:

Round papule, cherry red color, < 6mm in diameter.

* Other persons for whom evaluation is recommended include those with any congenital or very large (≥ 1.5cm) nevi, a history of dysplastic/atypical nevi or lentigo maligna, five or more nevi at least 6mm in diameter, at least 50 nevi at least 2mm in diameter, family history of melanoma, personal history of any skin cancer, more than 20 facial or 40 total actinic keratoses, chronic immunosuppression (particularly organ transplant recipients), or genetic syndromes associated with high skin cancer risk (e.g., xeroderma pigmentosum and basal cell nevus syndrome).

Adapted from: Weinstock MA, et al. Basic skin triage for teaching melanoma detection. *J Am Acad Dermatol* 1996; 34:1063-6 and Weinstock MA et al. Clinical diagnosis of moles vs melanoma. JAMA 1998;280:881-2.

ALGORITHM

Self Administered Melanoma Risk Stratification Questionnaire

Risk Factors for scoring the risk of melanoma

1. Does your skin have freckles or a tendency to freckling?	Yes____	No____	
2. Does you skin have moles?	None___	<20____	>20____
3. Does you skin have any large moles with irregular edge or color?	Yes_____	No_____	Don't know__
4. How many times in your life have you had bad sunburns?	Never____	1 or 2___	3+_____

This form can be used to allow patients to self select themselves into a high-risk group. This could be done while in a waiting room.

Scoring:
#1-Patient receives one point if answered yes
#2-Patient receives one point if answered >20
#3-Patient receives one point if answered yes
#4-Patient receives one point if answereed 1or 2 or 3+

If the overall score is 3 or 4, the patient is at high risk for melanoma and should receive further counseling and screening.

This risk assessment tool was validated in the following study:
Jackson A, Wilkinson C, August P. Can primary prevention or selective screening for melanoma be more precisely targeted through general practice? A prospective study to validate a self administered risk score. BMJ 1998;316:34-9

This study showed that 8.7% of the people completing the survey scored 3 or greater. This 8.7% had median a excess risk of greater than 60 for melanoma.

Appendix 2

- Consent form
- Survey
- Pictures referenced in the survey

UNC
SCHOOL OF MEDICINE
PROGRAM ON PREVENTION IN EDUCATION AND PRACTICE

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WHAT IS THE PURPOSE OF THIS STUDY? You are invited to participate in a research study entitled *"Early Detection and Prevention of Skin Cancer for the Primary Care Physician"*. The purpose of the study is evaluate the effectiveness of a curriculum to teach Primary Care Physicians knowledge and skills to allow them to better detect and prevent skin cancer. If this curriculum is effective, it will be instituted as a continuing medical education (CME) program for North Carolina physicians. You are being asked to participate because you are in an internal medicine or family medicine residency program in North Carolina.

The study is being conducted by:

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WHAT WILL I BE ASKED TO DO? Residency programs will be randomized to control or intervention group. Both groups will be asked to complete a questionnaire that will take about 5-10 minutes. This questionnaire will inquire about your knowledge, attitudes, and behavior toward skin cancer prevention and early detection. Following the initial survey, the intervention group will be asked to receive a 50-minute presentation entitled *"Early Detection and Prevention of Skin Cancer for the Primary Care Physician."* The control group will have their normal noon conference without the presentation. Two to three weeks later, both groups will be asked to fill out a similar post test questionnaire that will also take 5-10 minutes to complete. This post test questionnaire may be emailed to you if you are not present at the selected conference. After this follow up data is collected, the residency programs that are in the control group will have the opportunity to receive the 50-minute presentation at their request. There are no costs or payments for participating.

The University of North Carolina at Chapel Hill
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Skin Cancer Prevention Questionnaire

Thank you very much for taking a few minutes to complete this survey. Because you are training to be an internal medicine or family physician, your answers to the following questions are important to us.

**Please assign your questionnaire a four-digit unique identifier that you will remember: __-__-__-__ (i.e., the last four digits of your social security number or phone number)

**Please record the same number on your consent form

First, we are interested in what you know about skin cancer. **(Circle one)**

1) What is the most common cancer to present to a primary care physician?
   a. Lung
   b. Breast
   c. Colon
   d. Skin

2) Which of the following is a pre-cancerous lesion? **(Circle the one best answer)**
   a. Seborrheic keratosis
   b. Dermatofibroma
   c. Actinic keratosis
   d. Café-au-lait spot
   e. Dermal nevus

3) What is the most common type of skin cancer?
   a. Basal cell
   b. Squamous cell
   c. Dermatofibroma
   d. Melanoma

4) What is the lifetime risk of developing melanoma in 2000?
   a. 1/34
   b. 1/74
   c. 1/100
   d. 1/194

5) What is the 5-year survival rate for a melanoma that is less than 1 millimeter thick?
   a. 40%
   b. 50%
   c. 80%
   d. 95%

6) What is the 5-year survival rate for a primary melanoma lesion that is >4 millimeters thick without known metastasis?
   a. 30%
   b. 50%
   c. 75%
   d. 95%

10) 45 year old woman with lesion on her arm. (please see **picture D**, attached)

A) What is the most likely diagnosis for this lesion?

a. Seborrheic keratosis
b. Basal cell carcinoma
c. Angioma
d. Melanoma
e. Nevus

B) What would you do next?

a. Act (biopsy and/or refer)
b. Reassure the patient and provide counseling and education
c. Track (Reevaluate in 2 months to look for changes in the lesion)
d. Perform cryotherapy and follow up

11) 55 year old male with lesion on his back. (please see **picture E**, attached)

A) What is the most likely diagnosis for this lesion?

a. Seborrheic keratosis
b. Basal cell carcinoma
c. Angioma
d. Melanoma
e. Actinic keratosis

B) What would you do next?

a. Act (biopsy and/or refer)
b. Reassure the patient and provide counseling and education
c. Track (Reevaluate in 2 months to look for changes in the lesion)
d. Perform cryotherapy and follow up

12) 47 year old woman with lesion on her leg. (please see **picture F**, attached)

A) What is the most likely diagnosis for this lesion?

a. Seborrheic keratosis
b. Basal cell carcinoma
c. Angioma
d. Melanoma
e. Nevus

B) What would you do next?

a. Act (biopsy and/or refer)
b. Reassure the patient and provide counseling and education
c. Track (Reevaluate in 2 months to look for changes in the lesion)
d. Perform cryotherapy and follow up

Please rate each statement from 1 to 5 (Circle one)

	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree
18) Total body self exam (TBSE) is effective	1	2	3	4	5
19) Patients **do not** appreciate efforts to provide information on TBSE	1	2	3	4	5
20) Early detection of skin cancer can improve morbidity	1	2	3	4	5
21) Early detection of skin cancer can improve mortality	1	2	3	4	5
22) Physicians **cannot** be effective in helping patients decrease skin cancer risk	1	2	3	4	5
23) Patients want counseling about skin cancer prevention	1	2	3	4	5
24) Physician advice is one of the best ways of influencing a patient's decision to reduce their risk	1	2	3	4	5
25) Physician counseling about skin cancer **cannot** save lives	1	2	3	4	5
26) I am confident in my ability to diagnose skin lesions	1	2	3	4	5

Please rate each statement from 1 to 5

	Never	Infrequently	Sometimes	Often	Almost Always
During a visit with a patient who is "high risk" for developing skin cancer:					
27) I perform a total body skin exam	1	2	3	4	5
28) I ask about use of sunscreen	1	2	3	4	5
29) I advice and counsel about skin cancer risk	1	2	3	4	5
30) I provide resource materials on skin cancer	1	2	3	4	5

Finally, we would like to know a bit about you. **(Circle One)**

42) Specialty: Internal Medicine / Family Medicine / other(specify)_____

43) Level in training: PG-1 / PG-2 / PG-3 / other(specify)_____

44) Gender: MALE FEMALE

45) Have you had a clinical dermatology rotation lasting greater than 2 weeks at any point during your medical or residency training? YES NO

46) If you had a dermatology rotation, was this as a **(Circle all that apply)**
Medical student (MS1, MS2, MS3, MS4)
Resident (PG-1, PG2, PG3, PG4)
Other (specify)_____
I have not had a dermatology rotation.

47) Do you anticipate having a clinical dermatology rotation lasting greater than 2 weeks prior to completing training? YES NO

48) What are your career goals?
Specialty _____
Primary Care
Undecided

Please list and elaborate on any issues you think would help primary care physicians to institute preventive practices or early detective practices in their day-to-day practices.

Thank you for completing this survey.

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